

SEQUENCE LISTING

<110> Tuomanen, Elaine I
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Johnson, Leslie S.
Koenig, Scott

<120> POLYPEPTIDE COMPRISING THE AMINO ACID OF AN N-TERMINAL CHOLINE BINDING PROTEIN A TRUNCATE, VACCINE DERIVED THEREFROM AND USES THEREOF

<130> 5853-2

<140> 09/056,019
<141> 1998-04-07

<160> 40

<170> PatentIn Ver. 2.0

<210> 1
<211> 406
<212> PRT
<213> Streptococcus pneumoniae

<400> 1

Glu Asn Glu Gly Ala Thr Gln Val Pro Thr Ser Ser Asn Arg Ala Asn
1 5 10 15

Glu Ser Gln Ala Glu Gln Gly Glu Gln Pro Lys Lys Leu Asp Ser Glu
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Arg Asp Lys Ala Arg Lys Glu Val Glu Glu Tyr Val Lys Lys Ile Val
35 40 45

Gly Glu Ser Tyr Ala Lys Ser Thr Lys Lys Arg His Thr Ile Thr Val
50 55 60

Ala Leu Val Asn Glu Leu Asn Asn Ile Lys Asn Glu Tyr Leu Asn Lys
65 70 75 80

Ile Val Glu Ser Thr Ser Glu Ser Gln Leu Gln Ile Leu Met Met Glu
85 90 95

Ser Arg Ser Lys Val Asp Glu Ala Val Ser Lys Phe Glu Lys Asp Ser
100 105 110

Ser Ser Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser Asp
115 120 125

Thr Ala Lys Pro Asn Lys Pro Thr Glu Pro Gly Glu Lys Val Ala Glu
130 135 140

Ala Lys Lys Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys
145 150 155 160

Glu Glu Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu
 165 170 175

 Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu
 180 185 190

 Leu Val Lys Val Lys Ala Asn Glu Pro Arg Asp Glu Gln Lys Ile Lys
 195 200 205

 Gln Ala Glu Ala Glu Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu
 210 215 220

 Lys Lys Ile Lys Thr Asp Arg Glu Glu Ala Glu Glu Glu Ala Lys Arg
 225 230 235 240

 Arg Ala Asp Ala Lys Glu Gln Gly Lys Pro Lys Gly Arg Ala Lys Arg
 245 250 255

 Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala
 260 265 270

 Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser
 275 280 285

 Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu
 290 295 300

 Ala Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr
 305 310 315 320

 Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp
 325 330 335

 Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys
 340 345 350

 Glu Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu
 355 360 365

 Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg
 370 375 380

 Lys Lys Ala Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys
 385 390 395 400

 Val Lys Glu Lys Pro Ala
 405

<210> 2
 <211> 655
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 2
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Glu Ser Gln Ala Glu Gln Gly Glu Gln Pro Lys Lys Leu Asp Ser Glu
 20 25 30

Arg Asp Lys Ala Arg Lys Glu Val Glu Glu Tyr Val Lys Lys Ile Val
 35 40 45

Gly Glu Ser Tyr Ala Lys Ser Thr Lys Lys Arg His Thr Ile Thr Val
 50 55 60

Ala Leu Val Asn Glu Leu Asn Asn Ile Lys Asn Glu Tyr Leu Asn Lys
 65 70 75 80

Ile Val Glu Ser Thr Ser Glu Ser Gln Leu Gln Ile Leu Met Met Glu
 85 90 95

Ser Arg Ser Lys Val Asp Glu Ala Val Ser Lys Phe Glu Lys Asp Ser
 100 105 110

Ser Ser Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser Asp
 115 120 125

Thr Ala Lys Pro Asn Lys Pro Thr Glu Pro Gly Glu Lys Val Ala Glu
 130 135 140

Ala Lys Lys Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys
 145 150 155 160

Glu Glu Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu
 165 170 175

Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu
 180 185 190

Leu Val Lys Val Lys Ala Asn Glu Pro Arg Asp Glu Gln Lys Ile Lys
 195 200 205

Gln Ala Glu Ala Glu Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu
 210 215 220

Lys Lys Ile Lys Thr Asp Arg Glu Glu Ala Glu Glu Glu Ala Lys Arg
 225 230 235 240

Arg Ala Asp Ala Lys Glu Gln Gly Lys Pro Lys Gly Arg Ala Lys Arg
 245 250 255

Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala
 260 265 270

Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser
 275 280 285

Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu
 290 295 300

Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr
 305 310 315 320

Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp
 325 330 335

 Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys
 340 345 350

 Glu Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu
 355 360 365

 Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg
 370 375 380

 Lys Lys Ala Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys
 385 390 395 400

 Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Lys
 405 410 415

 Ala Glu Lys Pro Ala Pro Ala Pro Lys Pro Glu Asn Pro Ala Glu Gln
 420 425 430

 Pro Lys Ala Glu Lys Pro Ala Asp Gln Gln Ala Glu Glu Asp Tyr Ala
 435 440 445

 Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu Thr Gln Gln Gln Pro Pro
 450 455 460

 Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr Pro Lys Thr Gly Trp Lys
 465 470 475 480

 Gln Glu Asn Gly Met Trp Tyr Phe Tyr Asn Thr Asp Gly Ser Met Ala
 485 490 495

 Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ser Asn
 500 505 510

 Gly Ala Met Ala Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr
 515 520 525

 Leu Asn Ala Asn Gly Ser Met Ala Thr Gly Trp Leu Gln Asn Asn Gly
 530 535 540

 Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Ser Met Ala Thr Gly Trp Leu
 545 550 555 560

 Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Ser Met Ala
 565 570 575

 Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn
 580 585 590

 Gly Asp Met Ala Thr Gly Trp Val Lys Asp Gly Asp Thr Trp Tyr Tyr
 595 600 605

 Leu Glu Ala Ser Gly Ala Met Lys Ala Ser Gln Trp Phe Lys Val Ser
 610 615 620

Asp Lys Trp Tyr Tyr Val Asn Gly Ser Gly Ala Leu Ala Val Asn Thr
 625 630 635 640

Thr Val Asp Gly Tyr Gly Val Asn Ala Asn Gly Glu Trp Val Asn
 645 650 655

<210> 3
 <211> 284
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 3
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Glu Ser Gln Ala Glu Gln Gly Glu Gln Pro Lys Lys Leu Asp Ser Glu
 20 25 30

Arg Asp Lys Ala Arg Lys Glu Val Glu Glu Tyr Val Lys Lys Ile Val
 35 40 45

Gly Glu Ser Tyr Ala Lys Ser Thr Lys Lys Arg His Thr Ile Thr Val
 50 55 60

Ala Leu Val Asn Glu Leu Asn Asn Ile Lys Asn Glu Tyr Leu Asn Lys
 65 70 75 80

Ile Val Glu Ser Thr Ser Glu Ser Gln Leu Gln Ile Leu Met Met Glu
 85 90 95

Ser Arg Ser Lys Val Asp Glu Ala Val Ser Lys Phe Glu Lys Asp Ser
 100 105 110

Ser Ser Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser Asp
 115 120 125

Thr Ala Lys Pro Asn Lys Pro Thr Glu Pro Gly Glu Lys Val Ala Glu
 130 135 140

Ala Lys Lys Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys
 145 150 155 160

Glu Glu Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu
 165 170 175

Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu
 180 185 190

Leu Val Lys Val Lys Ala Asn Glu Pro Arg Asp Glu Gln Lys Ile Lys
 195 200 205

Gln Ala Glu Ala Glu Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu
 210 215 220

Lys Lys Ile Lys Thr Asp Arg Glu Glu Ala Glu Glu Ala Lys Arg

225	230	235	240
Arg Ala Asp Ala Lys Glu Gln Gly Lys Pro Lys Gly Arg Ala Lys Arg			
245	250	255	
Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala			
260	265	270	
Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu			
275	280		
<210> 4			
<211> 106			
<212> PRT			
<213> Streptococcus pneumoniae			
<400> 4			
Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala			
1	5	10	15
Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro			
20	25	30	
Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val			
35	40	45	
Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu			
50	55	60	
Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu Ser			
65	70	75	80
Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys			
85	90	95	
Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala			
100	105		
<210> 5			
<211> 109			
<212> PRT			
<213> Streptococcus pneumoniae			
<400> 5			
Thr Glu Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Val Glu Glu			
1	5	10	15
Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr			
20	25	30	
Pro Thr Ile Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp			
35	40	45	
Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Val Lys Ala Asn			
50	55	60	

Glu	Pro	Arg	Asp	Glu	Gln	Lys	Ile	Lys	Gln	Ala	Glu	Ala	Glu	Val	Glu
65				70					75					80	
Ser	Lys	Gln	Ala	Glu	Ala	Thr	Arg	Leu	Lys	Lys	Ile	Lys	Thr	Asp	Arg
				85				90					95		
Glu	Glu	Ala	Glu	Glu	Ala	Lys	Arg	Arg	Ala	Asp	Ala				
				100		105									

<210> 6
<211> 4
<212> PRT
<213> Streptococcus pneumoniae

<220>
<221> NON_CONS
<222> (2)..(3)
<223> They could be any amino acid at these two locations.

<400> 6
Lys Xaa Xaa Glu
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<210> 7
<211> 376
<212> PRT
<213> Streptococcus pneumoniae

<400> 7
Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr Ser Ser Asn Met Ala Lys
1 5 10 15

Thr Glu His Arg Lys Ala Ala Lys Gln Val Val Asp Glu Tyr Ile Glu
20 25 30

Lys Met Leu Arg Glu Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn
35 40 45

Val Ala Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Arg
50 55 60

Glu Leu Asn Val Leu Glu Lys Ser Lys Asp Glu Leu Pro Ser Glu
65 70 75 80

Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr
85 90 95

Leu Lys Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu
100 105 110

Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr
115 120 125

Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp
 130 135 140

Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys
 145 150 155 160

Glu Ser Arg Asn Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu
 165 170 175

Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg
 180 185 190

Lys Lys Ala Glu Glu Ala Lys Arg Lys Ala Asp Ala Lys Leu Lys
 195 200 205

Glu Ala Asn Val Ala Thr Ser Asp Gln Gly Lys Pro Lys Gly Arg Ala
 210 215 220

Lys Arg Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn
 225 230 235 240

Asp Ala Lys Ser Ser Asp Ser Val Gly Glu Glu Thr Leu Pro Ser
 245 250 255

Ser Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val
 260 265 270

Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg
 275 280 285

Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile Ala Glu
 290 295 300

Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu
 305 310 315 320

Ala Lys Glu Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys
 325 330 335

Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr
 340 345 350

Asp Arg Lys Lys Ala Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu
 355 360 365

Asp Lys Val Lys Glu Lys Pro Ala
 370 375

<210> 8
 <211> 663
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 8
 Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr Ser Ser Asn Met Ala Lys
 1 5 10 15

Thr Glu His Arg Lys Ala Ala Lys Gln Val Val Asp Glu Tyr Ile Glu
 20 25 30

Lys Met Leu Arg Glu Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn
 35 40 45

Val Ala Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Arg
 50 55 60

Glu Leu Asn Val Leu Glu Glu Lys Ser Lys Asp Glu Leu Pro Ser Glu
 65 70 75 80

Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr
 85 90 95

Leu Lys Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu
 100 105 110

Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr
 115 120 125

Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp
 130 135 140

Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys
 145 150 155 160

Glu Ser Arg Asn Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu
 165 170 175

Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg
 180 185 190

Lys Lys Ala Glu Glu Ala Lys Arg Lys Ala Asp Ala Lys Leu Lys
 195 200 205

Glu Ala Asn Val Ala Thr Ser Asp Gln Gly Lys Pro Lys Gly Arg Ala
 210 215 220

Lys Arg Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn
 225 230 235 240

Asp Ala Lys Ser Ser Asp Ser Val Gly Glu Glu Thr Leu Pro Ser
 245 250 255

Ser Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val
 260 265 270

Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg
 275 280 285

Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile Ala Glu
 290 295 300

Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu
 305 310 315 320

Ala Lys Glu Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys
325 330 335

Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr
340 345 350

Asp Arg Lys Lys Ala Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu
355 360 365

Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala
370 375 380

Thr Gln Pro Glu Lys Pro Ala Pro Lys Pro Glu Lys Pro Ala Glu Gln
385 390 395 400

Pro Lys Ala Glu Lys Thr Asp Asp Gln Gln Ala Glu Glu Asp Tyr Ala
405 410 415

Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu Thr Gln Gln Gln Pro Pro
420 425 430

Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr Pro Lys Thr Gly Trp Lys
435 440 445

Gln Glu Asn Gly Met Trp Tyr Phe Tyr Asn Thr Asp Gly Ser Met Ala
450 455 460

Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn
465 470 475 480

Gly Ala Met Ala Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr
485 490 495

Leu Asn Ala Asn Gly Ser Met Ala Thr Gly Trp Leu Gln Asn Asn Gly
500 505 510

Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Ala Met Ala Thr Gly Trp Leu
515 520 525

Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ser Asn Gly Ala Met Ala
530 535 540

Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn
545 550 555 560

Gly Asp Met Ala Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr
565 570 575

Leu Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Leu Gln Tyr Asn Gly
580 585 590

Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Val
595 600 605

Lys Asp Gly Asp Thr Trp Tyr Tyr Leu Glu Ala Ser Gly Ala Met Lys
610 615 620

Ala Ser Gln Trp Phe Lys Val Ser Asp Lys Trp Tyr Tyr Val Asn Gly
625 630 635 640

Ser Gly Ala Leu Ala Val Asn Thr Thr Val Asp Gly Tyr Gly Val Asn
645 650 655

Ala Asn Gly Glu Trp Val Asn
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<210> 9
<211> 254
<212> PRT
<213> Streptococcus pneumoniae

<400> 9
Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr Ser Ser Asn Met Ala Lys
1 5 10 15

Thr Glu His Arg Lys Ala Ala Lys Gln Val Val Asp Glu Tyr Ile Glu
20 25 30

Lys Met Leu Arg Glu Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn
35 40 45

Val Ala Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Arg
50 55 60

Glu Leu Asn Val Leu Glu Glu Lys Ser Lys Asp Glu Leu Pro Ser Glu
65 70 75 80

Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr
85 90 95

Leu Lys Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu
100 105 110

Ala Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr
115 120 125

Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp
130 135 140

Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys
145 150 155 160

Glu Ser Arg Asn Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu
165 170 175

Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg
180 185 190

Lys Lys Ala Glu Glu Ala Lys Arg Lys Ala Asp Ala Lys Leu Lys
195 200 205

Glu Ala Asn Val Ala Thr Ser Asp Gln Gly Lys Pro Lys Gly Arg Ala

210

215

220

Lys Arg Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn
225 230 235 240

Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu
245 250

<210> 10
<211> 106
<212> PRT
<213> Streptococcus pneumoniae

<400> 10
Lys Ser Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala
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Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro
20 25 30

Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile Ala Glu Ser Asp Val
35 40 45

Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu
50 55 60

Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys Val Glu Ser
65 70 75 80

Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Lys
85 90 95

Lys Ala Glu Glu Ala Lys Arg Lys Ala
100 105

<210> 11
<211> 107
<212> PRT
<213> Streptococcus pneumoniae

<400> 11
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20 25 30

Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp Val Lys
35 40 45

Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Ser
50 55 60

Arg Asn Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu Ser Lys
65 70 75 80

Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Lys Lys
85 90 95

Ala Glu Glu Glu Ala Lys Arg Lys Ala Asp Ala
100 105

<210> 12
<211> 1219
<212> DNA
<213> Streptococcus pneumoniae

<400> 12
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gaacaaggag aacaacctaa aaaactcgat tcagaacgag ataaggcaag gaaagaggc 120
gaggaatatg taaaaaaaaat agtgggtgag agctatgcaaa aatcaactaa aaagcgacat 180
acaattactg tagctctagt taacgagttg aacaacatta agaacgagta ttgtataaaa 240
atagttgaat caacccaga aagccaacta cagatactga tgatggagag tcgatcaaaa 300
gtagatgaag ctgtgtctaa gtttggaaaag gactcatctt cttcgtcaag ttccagactct 360
tccactaaac cgaaagcttc agatacagcg aagccaaaca agccgacaga accaggagaa 420
aaggtagcag aagctaagaa gaagggttggaa gaagctgaga aaaaagccaa ggatcaaaaa 480
gaagaagatc gtcgtacta cccaaaccatt acttacaaaaa cgcttgaact tgaaattgct 540
gagtccgatg tggaaatgtaa aaaagcggag cttgaactag taaaatgtgaa agctaacgaa 600
cctcgagacg agcaaaaaat taagcaagca gaagcggaaag ttgagatgaa acaagctgag 660
gtcataaggat taaaaaaaaat caagacagat cgtgaagaag cagaagaaga agctaaacgaa 720
agagcagatg ctaaagagca aggttaaacca aaggggcggg caaaacgagg agttccctgga 780
gagctagcaa cacctgataa aaaagaaaaat gatgcgaagt cttcagattc tagcgttaggt 840
gaagaaactc ttccaagccc atccctgaaa ccagaaaaaa aggttagcaga agctgagaag 900
aagggttgaag aagctaagaa aaaagccgag gatcaaaaaa aagaagatcg ccgtaaactac 960
ccaaaccaata cttacaaaac gcttgaactt gaaattgctg agtccgatgt ggaagttaaa 1020
aaagcggagc ttgaactagt aaaagaggaa gctaaggaaac ctcgaaacgaa ggaaaaagtt 1080
aagcaagcaa aagcggaaatg tgagatgaaa aaagctgagg ctacaaggtt agaaaaaaatc 1140
aagacagatc gtaaaaaaaaatc agaagaagaa gctaaacgaa aagcagcaga agaagataaa 1200
gtttaaagaaa aaccagctg 1219

<210> 13
<211> 1969
<212> DNA
<213> Streptococcus pneumoniae

<400> 13
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gaacaaggag aacaacctaa aaaactcgat tcagaacgag ataaggcaag gaaagaggc 120
gaggaatatg taaaaaaaaat agtgggtgag agctatgcaaa aatcaactaa aaagcgacat 180
acaattactg tagctctagt taacgagttg aacaacatta agaacgagta ttgtataaaa 240
atagttgaat caacccaga aagccaacta cagatactga tgatggagag tcgatcaaaa 300
gtagatgaag ctgtgtctaa gtttggaaaag gactcatctt cttcgtcaag ttccagactct 360
tccactaaac cgaaagcttc agatacagcg aagccaaaca agccgacaga accaggagaa 420
aaggtagcag aagctaagaa gaagggttggaa gaagctgaga aaaaagccaa ggatcaaaaa 480
gaagaagatc gtcgtacta cccaaaccatt acttacaaaaa cgcttgaact tgaaattgct 540
gagtccgatg tggaaatgtaa aaaagcggag cttgaactag taaaatgtgaa agctaacgaa 600
cctcgagacg agcaaaaaat taagcaagca gaagcggaaag ttgagatgaa acaagctgag 660
gtcataaggat taaaaaaaaat caagacagat cgtgaagaag cagaagaaga agctaaacgaa 720
agagcagatg ctaaagagca aggttaaacca aaggggcggg caaaacgagg agttccctgga 780
gagctagcaa cacctgataa aaaagaaaaat gatgcgaagt cttcagattc tagcgttaggt 840
gaagaaactc ttccaagccc atccctgaaa ccagaaaaaa aggttagcaga agctgagaag 900

aagggtgaag aagctaagaa aaaagccgag gatcaaaaag aagaagatcg ccgtaactac 960
 ccaaccaata cttacaaaac gcttgaactt gaaattgctg agtccgatgt ggaagttaaa 1020
 aaagcggagg cttgaactag taaaagagga agctaaggaa cctcgaaacg agaaaaaaagt 1080
 taagcaagca aaagcggaaag ttgagagtagaa aaaagcttag gctacaaggt tagaaaaaaat 1140
 caagacagat cgtaaaaaaag cagaagaaga agctaaacga aaagcagcag aagaagataa 1200
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 agctccagct cccaaaaccag agaatccagc tgaacaacca aaagcagaaa aaccagctga 1320
 tcaacaagct gaagaagact atgctcgtag atcagaagaa gaatataatc gcttgactca 1380
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 cccaaaacaat ggctcatggt actacctcaa cagcaatggc gctatggcga caggtggct 1560
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 ccaatacaat ggctcatggt actacctaaa cgctaatggt gatatggcga caggtgggt 1800
 gaaagatgga gataacctggt actatcttga agcatcaggt gctatgaaag caagccaatg 1860
 gtccaaagta tcagataaat ggtactatgt caatggctca ggtgccctt cagtcaacac 1920
 aactgttagat ggctatggag tcaatgccaa tggtgaatgg gtaaactaa 1969

<210> 14
 <211> 853
 <212> DNA
 <213> *Streptococcus pneumoniae*

<400> 14
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 gaacaaggag aacaacctaa aaaactcgat tcagaacgag ataaggcaag gaaagaggtc 120
 gaggaatatg taaaaaaaaat agtgggttag agctatgcaaa aatcaactaa aaagcgacat 180
 acaattactg tagctctagt taacgagttg aacaacatta agaacagata tttaataaaa 240
 atagttgaat caacccaga aagccaaacta cagatactga ttagggagag tcgatcaaaa 300
 gtagatgaag ctgtgtctaa gtttggaaaag gactcatctt cttcgtaag ttcaagactct 360
 tccactaaac cggaagcttc agatacagcg aagccaaaca agccgacaga accaggagaa 420
 aaggtagcag aagctaagaa gaagggttagaa gaagctgaga aaaaagccaa ggatcaaaaaa 480
 gaagaagatc gtcgtacta cccaaaccatt acttacaaaaa cgcttgaact tggaaattgct 540
 gagtcccgatg tggaaatggaaa aaaaagcggag cttgaacttag taaaagtgaa agctaacgaa 600
 cctcgagacg agcaaaaaat taagcaagca gaagcggaaat tttagagtagaa acaagctgag 660
 gctacaaggt taaaaaaaaat caagacagat cgtgaagaag cagaagaaga agctaaacga 720
 agagcagatg cttaaagagca aggttaaacca aaggggcggg caaaacgagg agttccttgg 780
 gagctagcaa cacctgataa aaaaagaaaat gatgcaagttt cttcagattc tagcgttaggt 840
 gaagaaaactc ttc 853

<210> 15
 <211> 318
 <212> DNA
 <213> *Streptococcus pneumoniae*

<400> 15
 aaaccagaaa aaaaggttagc agaagctgag aagaagggttg aagaagctaa gaaaaaaagcc 60
 gaggatcaaa aagaagaaga tcgcccgtaa tacccaacca atacttacaa aacgcttggaa 120
 cttgaaattt ctgagtccga tgtggaaagtt aaaaagcgg agcttgaact agttaaaagag 180
 gaagctaagg aacctcgaaa cgaggaaaaa gtttagcaag caaaagcgg agttgagagt 240
 aaaaagctg aggctacaag gtttagaaaaa atcaagacag atcgtaaaaaa agcagaagaa 300
 gaagctaaac gaaaagca 318

<210> 16
 <211> 327
 <212> DNA

<213> Streptococcus pneumoniae

<400> 16

acagaaccag gagaaaagg agcagaagct aagaagaagg ttgaagaagc tgaaaaaaa 60
gccaaggatc aaaaagaaga agatcgctgt aactacccaa ccattactta caaaacgctt 120
gaacttgaaa ttgctgagtc cgatgtggaa gttaaaaag cgagctgta actagtaaaa 180
gtgaaagcta acgaacctcg agacgagcaa aaaattaagc aagcagaagc ggaagttgag 240
agtaaacaag ctgaggctac aaggttaaaa aaaatcaaga cagatcgta agaagcagaa 300
gaagaagcta aacgaagagc agatgct 327

<210> 17

<211> 1129

<212> DNA

<213> Streptococcus pneumoniae

<400> 17

gaaaacgaag gaagtaccca agcagccact tcttctaata tggcaaagac agaacatagg 60
aaagctgcta aacaagtcgt cgatgaatat atagaaaaaa tggttaggaa gattcaacta 120
gatagaagaa aacataacca aaatgtcgcc ttaaacataa agttgagcgc aattaaaacg 180
aagtatttgc gtgaattaaa tgtttagaa gagaagtcga aagatgagtt gccgtcagaa 240
ataaaagcaa agttagacgc agcttttag aagttaaaa aagatacatt gaaaccagga 300
gaaaaggtag cagaagctaa gaagaagggt gaagaagcta agaaaaaagc cgaggatcaa 360
aaagaagaag atcgctgtaa ctacccaacc aatacttaca aaacgctgta acttgaatt 420
gctgagttcg atgtgaaagt taaagaagcg gagttgaac tagtaaaaaga ggaagctaaa 480
gaatctcgaa acgagggcac attaagcaa gcaaaagaga aagttgagag taaaaaagct 540
gaggctacaa gtttagaaaa catcaagaca gatcgtaaaa aagcagaaga agaagctaaa 600
cgaaaagcaag atgctaagtt gaaggaagct aatgtagcga ctccagatca aggtaaacca 660
aaggggcgccc caaaacgagg agttcctgaa gagctgaa cacctgataa aaaagaaaaat 720
gatgcgaagt ctccagattc tagcgtaggt gaagaaactc ttccaagctc atccctgaaa 780
tcaggaaaaa aggtagcaga agctgagaag aaggttgaag aagctgagaa aaaagccaag 840
gatcaaaaag aagaagatcg ccgtaactac ccaaccaata cttacaaaac gcttgacctt 900
gaaattgctg agtccgatgt gaaagttaaa gaagcggagc ttgaactagt aaaagaggaa 960
gctaaggaac ctccagacga gaaaaaaatt aagcaagcaa aagcgaagtt tgagagtaaa 1020
aaagctgagg ctacaagggtt agaaaaacatc aagacagatc gtaaaaaaagc agaagaagaa 1080
gcttaaacgaa aagcagcaga agaagataaa gttaaagaaaa aaccagctg 1129

<210> 18

<211> 1992

<212> DNA

<213> Streptococcus pneumoniae

<400> 18

gaaaacgaag gaagtaccca agcagccact tcttctaata tggcaaagac agaacatagg 60
aaagctgcta aacaagtcgt cgatgaatat atagaaaaaa tggttaggaa gattcaacta 120
gatagaagaa aacataacca aaatgtcgcc ttaaacataa agttgagcgc aattaaaacg 180
aagtatttgc gtgaattaaa tgtttagaa gagaagtcga aagatgagtt gccgtcagaa 240
ataaaagcaa agttagacgc agcttttag aagttaaaa aagatacatt gaaaccagga 300
gaaaaggtag cagaagctaa gaagaagggt gaagaagcta agaaaaaagc cgaggatcaa 360
aaagaagaag atcgctgtaa ctacccaacc aatacttaca aaacgctgta acttgaatt 420
gctgagttcg atgtgaaagt taaagaagcg gagttgaac tagtaaaaaga ggaagctaaa 480
gaatctcgaa acgagggcac attaagcaa gcaaaagaga aagttgagag taaaaaagct 540
gaggctacaa gtttagaaaa catcaagaca gatcgtaaaa aagcagaaga agaagctaaa 600
cgaaaagcaag atgctaagtt gaaggaagct aatgtagcga ctccagatca aggtaaacca 660
aaggggcgccc caaaacgagg agttcctgaa gagctgaa cacctgataa aaaagaaaaat 720
gatgcgaagt ctccagattc tagcgtaggt gaagaaactc ttccaagctc atccctgaaa 780
tcaggaaaaa aggtagcaga agctgagaag aaggttgaag aagctgagaa aaaagccaag 840
gatcaaaaag aagaagatcg ccgtaactac ccaaccaata cttacaaaac gcttgacctt 900

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gaaattgctg agtccgatgt gaaagttaaa gaagcggagc ttgaactagt aaaagaggaa 960
gctaaggAAC ctcgagacga ggaaaaaatt aagcaagcaa aagcggaaagt tgagagtaaa 1020
aaagctgagg ctacaaggTTT agaaaacATC aagacagatC gtaaaaaAGC agaagaagaa 1080
gctaaACGAA aagcAGCAGA agaagataaa gttaaAGAAA aaccAGCTGA acaACCACAA 1140
CCAGCGCCGG CTACTCAACC agaaaaACCA GCTCCAAAAC cAGAGAAGCC agCTGAACAA 1200
CCAAAAGCAG AAAAAACAGA TgATCAACAA GCTGAAGAAG ACTATGCTCG tagATCAGAA 1260
gaagaatata atcgcttgac tcaacAGCAA CCGCCAAAAA CTGAAAACC agcACAACCA 1320
tctactccaa aaacaggCTG gaaacaAGAA aacGGTATGT ggtacttcta caataCTGAT 1380
ggttcaatgg caacaggatG gctccAAAAC aacGGTTCAT ggtactatCT aaacGCTAA 1440
ggtgctatgg cgacaggatG gctccAAAAC aatGGTTCAT ggtactatCT aaacGCTAA 1500
ggttcaatgg caacaggatG gctccAAAAC aatGGTTCAT ggtactacCT aaacGCTAA 1560
ggtgctatgg cgacaggatG gctccAAATAC aatGGTTCAT ggtactacCT aaacAGCAAT 1620
ggcgctatgg cgacaggatG gctccAAATAC aatGGCTCAT ggtactacCT caacGCTAA 1680
ggtgatatgg cgacaggatG gctccAAAAC aacGGTTCAT ggtactacCT caacGCTAA 1740
ggtgatatgg cgacaggatG gctccAAATAC aacGGTTCAT ggtattacCT caacGCTAA 1800
ggtgatatgg cgacaggTTT ggtgaaAGAT ggAGATACTT ggtactatCT tgaAGCATCA 1860
ggtgctatga aagcaAGCCA atGGTCAAA gtATCAGATA aatGGTACTA tgtCAATGGC 1920
tcaggtgccc ttgcagtcaa cacaACTGTA gatGGCTATG gagtCAATGC caatGGTGA 1980
tgggtaaact AA

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<210> 19
<211> 763
<212> DNA
<213> Streptococcus pneumoniae

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<400> 19
aaaaacgaag gaagtaccca agcagccact tcttctaata tggcaaagac agaacatagg 60
aaagctgcta aacaagtgcgt cgatgaatat atagaaaaaaaa tgttgaggga gattcaacta 120
gatagaagaa aacatacccc aaatgtcgcc tttaaacataa agttgagcgc aattaaaacg 180
aagtatttgc gtgaattaaa tgtttttagaa gagaagtgcga aagatgagtt gccgtcagaa 240
ataaaaagcaa agttagacgc agcttttgag aagtttaaaa aagatacatt gaaaccagga 300
aaaaaggtag cagaagctaa gaagaaggtt gaagaagcta agaaaaaaagc cgaggatcaa 360
aaagaagaag atcgtcgtaa ctaccccaacc aataacttaca aaacgcttga acttggaaatt 420
gctgagttcg atgtgaaagt taaagaagcg gagcttgaac tagtaaaaaga ggaagctaaa 480
aatctcgaa acgagggcac aattaagcaa gcaaaaagaga aagttgagag taaaaaagct 540
gaggctacaa ggtagaaaaa catcaagaca gatcgtaaaa aagcagaaga agaagctaaa 600
cgaaaagcag atgctaagtt gaagggaaagct aatgtagcga cttcagatca aggttaaacc 660
aaggggcggg caaaaacgagg agttccctgga gagctagcaa cacctgataa aaaagaaaaat 720
gatgcgaagt cttcagattc tagcgttaggt gaaqaaaactc ttc 763

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<210> 20
<211> 318
<212> DNA
<213> *Streptococcus pneumoniae*

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<400> 20
aaatcaggaa aaaaggttagc agaagcttag aagaaggttt aagaagctga gaaaaaaagcc 60
aaggatcaaa aagaagaaga tcgccccataac tacccaaacca atactttacaa aacgcttgac 120
cttggaaattt ctgagtcgcgta tgtgaaagtt aaagaaggcg agcttgaact agtaaaagag 180
gaagctaagg aacctcgaga cgaggaaaaaa attaagcaag caaaagcgaa agttgagagt 240
aaaaaagctg aggctacaag gtttagaaaac atcaagacag atcgtaaaaa agcagaagaa 300
gaagctaaac gaaaaagca 318
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```
<210> 21
<211> 321
<212> DNA
<213> Streptococcus pneumoniae
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<400> 21
ccaggagaaa aggtagcaga agctaagaag aaggttgaag aagctaagaa aaaagccgag 60
gatcaaaaag aagaagatcg tcgtaactac ccaaccaata cttacaaaac gcttgaactt 120
gaaattgctg agttcgatgt gaaagttaaa gaacgggagc ttgaactagt aaaagaggaa 180
gctaaagaat ctcgaaacga gggcacaatt aagcaagcaa aagagaaaat tgagagtaaa 240
aaagctgagg ctacaagggtt agaaaacatc aagacagatc gtaaaaaaagc agaagaagaa 300
gctaaacgaa aagcagatgc t 321

<210> 22
<211> 121
<212> PRT
<213> Streptococcus pneumoniae

<400> 22
Ser Pro Ser Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys
1 5 10 15

Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg
20 25 30

Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala
35 40 45

Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu
50 55 60

Glu Ala Lys Glu Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala
65 70 75 80

Glu Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys
85 90 95

Thr Asp Arg Lys Lys Ala Glu Glu Ala Lys Arg Lys Ala Ala Glu
100 105 110

Glu Asp Lys Val Lys Glu Lys Pro Ala
115 120

<210> 23
<211> 122
<212> PRT
<213> Streptococcus pneumoniae

<400> 23
Pro Ser Ser Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Glu Lys
1 5 10 15

Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp
20 25 30

Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile
35 40 45

Ala Glu Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys
50 55 60

Glu	Glu	Ala	Lys	Glu	Pro	Arg	Asp	Glu	Glu	Lys	Ile	Lys	Gln	Ala	Lys
65				70						75					80
Ala	Lys	Val	Glu	Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Asn	Ile
		85								90					95
Lys	Thr	Asp	Arg	Lys	Lys	Ala	Glu	Glu	Ala	Lys	Arg	Lys	Ala	Ala	
		100								105					110
Glu	Glu	Asp	Lys	Val	Lys	Glu	Lys	Arg	Ala						
		115								120					

<210> 24
<211> 428
<212> PRT
<213> Streptococcus pneumoniae

<400> 24															
Glu	Asn	Glu	Gly	Ala	Thr	Gln	Val	Pro	Thr	Ser	Ser	Asn	Arg	Ala	Asn
1				5					10						15
Glu	Ser	Gln	Ala	Glu	Gln	Gly	Glu	Gln	Pro	Lys	Lys	Leu	Asp	Ser	Glu
				20					25						30
Arg	Asp	Lys	Ala	Arg	Lys	Glu	Val	Glu	Glu	Tyr	Val	Lys	Lys	Ile	Val
				35					40						45
Gly	Glu	Ser	Tyr	Ala	Lys	Ser	Thr	Lys	Lys	Arg	His	Thr	Ile	Thr	Val
				50					55						60
Ala	Leu	Val	Asn	Glu	Leu	Asn	Asn	Ile	Lys	Asn	Glu	Tyr	Leu	Asn	Lys
				65					70						80
Ile	Val	Glu	Ser	Thr	Ser	Glu	Ser	Gln	Leu	Gln	Ile	Leu	Met	Met	Glu
				85					90						95
Ser	Arg	Ser	Lys	Val	Asp	Glu	Ala	Val	Ser	Lys	Phe	Glu	Lys	Asp	Ser
				100					105						110
Ser	Ser	Ser	Ser	Ser	Asp	Ser	Ser	Thr	Lys	Pro	Glu	Ala	Ser	Asp	
				115					120						125
Thr	Ala	Lys	Pro	Asn	Lys	Pro	Thr	Glu	Pro	Gly	Glu	Lys	Val	Ala	Glu
				130					135						140
Ala	Lys	Lys	Val	Glu	Glu	Ala	Glu	Lys	Lys	Ala	Lys	Asp	Gln	Lys	
				145					150						160
Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Ile	Thr	Tyr	Lys	Thr	Leu	Glu
				165					170						175
Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Glu	Val	Lys	Lys	Ala	Glu	Leu	Glu
				180					185						190
Leu	Val	Lys	Val	Lys	Ala	Asn	Glu	Pro	Arg	Asp	Glu	Gln	Lys	Ile	Lys

195	200	205
Gln Ala Glu Ala Glu Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu		
210	215	220
Lys Lys Ile Lys Thr Asp Arg Glu Glu Ala Glu Glu Ala Lys Arg		
225	230	235
Arg Ala Asp Ala Lys Glu Gln Gly Lys Pro Lys Gly Arg Ala Lys Arg		
245	250	255
Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala		
260	265	270
Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser		
275	280	285
Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu		
290	295	300
Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr		
305	310	315
Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp		
325	330	335
Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys		
340	345	350
Glu Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu		
355	360	365
Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg		
370	375	380
Lys Lys Ala Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys		
385	390	395
400		400
Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Lys		
405	410	415
Ala Glu Lys Pro Ala Pro Ala Pro Lys Pro Glu Asn		
420	425	

<210> 25
<211> 23
<212> DNA
<213> Streptococcus pneumoniae

<400> 25
ggcggatcca tggaraayga rgg

<210> 26
<211> 33
<212> DNA
<213> Streptococcus pneumoniae

23

<400> 26
 gccgtcgact tagtttaccc attcaccatt ggc 33

 <210> 27
 <211> 5
 <212> PRT
 <213> Streptococcus pneumoniae

 <220>
 <221> VARIANT
 <222> (1)
 <223> It could be any amino acid.

 <400> 27
 Xaa Glu Asn Glu Gly
 1 5

 <210> 28
 <211> 439
 <212> PRT
 <213> Streptococcus pneumoniae

 <220>
 <221> VARIANT
 <222> (243)
 <223> It could be any amino acid.

 <400> 28
 Ala Val Ala Ser Leu Phe Met Gly Ser Val Val His Ala Thr Glu Lys
 1 5 10 15

 Glu Val Thr Thr Gln Val Ala Thr Ser Ser Asn Lys Ala Asn Lys Ser
 20 25 30

 Gln Thr Glu His Met Lys Ala Ala Lys Gln Val Asp Glu Tyr Ile Lys
 35 40 45

 Lys Lys Leu Gln Leu Asp Arg Arg Lys His Thr Gln Asn Val Gly Leu
 50 55 60

 Leu Thr Lys Leu Gly Val Ile Lys Thr Glu Tyr Leu His Gly Leu Ser
 65 70 75 80

 Val Ser Lys Lys Ser Glu Ala Glu Leu Pro Ser Glu Ile Lys Ala
 85 90 95

 Lys Leu Asp Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Leu Pro Thr
 100 105 110

 Glu Pro Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala
 115 120 125

 Lys Lys Lys Ala Glu Asp Gln Lys Glu Lys Asp Leu Arg Asn Tyr Pro
 130 135 140

Thr Asn Thr Tyr Lys Thr Leu Glu Leu Asp Ile Ala Glu Ser Asp Val
145 150 155 160

Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu
165 170 175

Ser Arg Asp Glu Lys Lys Ile Asn Gln Ala Lys Ala Lys Val Glu Asn
180 185 190

Lys Lys Ala Glu Ala Thr Arg Leu Lys Asn Ile Lys Thr Asp Arg Glu
195 200 205

Lys Ala Glu Glu Ala Lys Arg Arg Ala Asp Ala Lys Leu Gln Glu Ala
210 215 220

Asn Val Ala Thr Ser Glu Gln Asp Lys Ser Lys Arg Arg Ala Lys Arg
225 230 235 240

Glu Val Xaa Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala
245 250 255

Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Thr Ser Pro Ser
260 265 270

Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu
275 280 285

Ala Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr
290 295 300

Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp
305 310 315 320

Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys
325 330 335

Glu Ser Arg Asn Glu Glu Lys Ile Lys Gln Val Lys Ala Lys Val Glu
340 345 350

Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg
355 360 365

Lys Lys Ala Glu Glu Glu Ala Lys Arg Arg Ala Ala Glu Glu Asp
370 375 380

Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Ala Pro Ala Pro
385 390 395 400

Gln Pro Glu Lys Pro Thr Glu Glu Pro Glu Asn Pro Ala Pro Ala Pro
405 410 415

Ala Pro Lys Pro Glu Asn Pro Ala Glu Lys Pro Lys Ala Glu Lys Pro
420 425 430

Ala Asp Gln Gln Ala Glu Glu
435

<210> 29
 <211> 437
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 29
 Ala Val Ala Ser Leu Phe Met Gly Ser Val Val His Ala Thr Glu Lys
 1 5 10 15

Glu Val Thr Thr Gln Val Ala Thr Ser Ser Asn Arg Ala Asn Lys Ser
 20 25 30

Gln Thr Glu His Met Lys Ala Ala Lys Gln Val Asp Glu Tyr Ile Lys
 35 40 45

Lys Lys Leu Gln Leu Asp Arg Arg Lys His Thr Gln Asn Val Gly Leu
 50 55 60

Leu Thr Lys Leu Gly Val Ile Lys Thr Glu Tyr Leu His Gly Leu Ser
 65 70 75 80

Val Ser Lys Lys Ser Glu Ala Glu Leu Pro Ser Glu Ile Lys Ala
 85 90 95

Lys Leu Asp Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Leu Pro Thr
 100 105 110

Glu Pro Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala
 115 120 125

Lys Lys Lys Ala Glu Asp Gln Lys Glu Lys Asp Leu Arg Asn Tyr Pro
 130 135 140

Thr Asn Thr Tyr Lys Thr Leu Glu Leu Asp Ile Ala Glu Ser Asp Val
 145 150 155 160

Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu
 165 170 175

Ser Arg Asp Glu Lys Lys Ile Asn Gln Ala Lys Ala Lys Val Glu Asn
 180 185 190

Lys Lys Ala Glu Ala Thr Arg Leu Lys Asn Ile Lys Thr Asp Arg Glu
 195 200 205

Lys Ala Glu Glu Ala Lys Arg Arg Ala Asp Ala Lys Leu Gln Glu Ala
 210 215 220

Asn Val Ala Thr Ser Glu Gln Asp Lys Ser Lys Arg Arg Ala Lys Arg
 225 230 235 240

Glu Val Leu Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala
 245 250 255

Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Thr Ser Pro Ser
 260 265 270

Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu
 275 280 285

 Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr
 290 295 300

 Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp
 305 310 315 320

 Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys
 325 330 335

 Glu Ser Arg Asn Glu Glu Lys Ile Lys Gln Val Lys Ala Lys Val Glu
 340 345 350

 Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg
 355 360 365

 Lys Lys Ala Glu Glu Glu Ala Lys Arg Arg Ala Ala Glu Glu Asp
 370 375 380

 Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro
 385 390 395 400

 Gln Pro Glu Lys Pro Thr Glu Glu Pro Glu Asn Pro Ala Pro Ala Pro
 405 410 415

 Ala Pro Lys Pro Glu Asn Pro Ala Glu Lys Pro Lys Ala Glu Lys Pro
 420 425 430

 Ala Asp Gln Gln Ala
 435

<210> 30
 <211> 439
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 30
 Val Ala Val Ala Ser Leu Val Met Gly Ser Val Val His Ala Thr Glu
 1 5 10 15

 Lys Glu Val Thr Thr Gln Val Ala Thr Ser Ser Asn Arg Ala Asn Glu
 20 25 30

 Ser Gln Ala Gly His Arg Lys Ala Ala Glu Gln Phe Asp Glu Tyr Ile
 35 40 45

 Lys Thr Met Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn Phe Ala
 50 55 60

 Leu Asn Ile Lys Leu Ser Arg Ile Lys Thr Glu Tyr Leu Arg Lys Leu
 65 70 75 80

 Asn Val Leu Glu Glu Lys Ser Lys Ala Glu Leu Pro Ser Glu Thr Lys

85	90	95
Lys Glu Ile Asp Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Asn Arg		
100	105	110
Thr Lys Lys Thr Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Lys		
115	120	125
Lys Lys Ala Lys Ala Gln Lys Glu Glu Asp His Arg Asn Tyr Pro Thr		
130	135	140
Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Glu		
145	150	155
Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Ser		
165	170	175
Arg Asp Asp Glu Lys Ile Lys Gln Ala Glu Ala Lys Val Glu Ser Lys		
180	185	190
Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Glu Lys		
195	200	205
Ala Glu Glu Glu Ala Lys Arg Arg Ala Glu Ala Lys Leu Lys Glu Ala		
210	215	220
Val Glu Lys Asn Val Ala Thr Ser Glu Gln Asp Lys Pro Lys Gly Arg		
225	230	235
Arg Lys Arg Gly Val Pro Gly Glu Gln Ala Thr Pro Asp Lys Lys Glu		
245	250	255
Asn Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Ala Leu Pro		
260	265	270
Ser Pro Ser Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys		
275	280	285
Val Ala Glu Ala Glu Lys Lys Ala Lys Ala Gln Lys Glu Glu Asp Arg		
290	295	300
Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala		
305	310	315
Glu Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu		
325	330	335
Glu Ala Lys Glu Ser Arg Asn Glu Glu Lys Val Asn Gln Ala Lys Ala		
340	345	350
Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys		
355	360	365
Thr Asp Arg Lys Lys Ala Glu Glu Ala Lys Arg Lys Ala Ala Glu		
370	375	380
Glu Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro		

385	390	395	400
Ala Pro Gln Pro Glu Lys Pro Thr Glu Glu Pro Glu Asn Pro Ala Pro			
405		410	415
Ala Pro Lys Pro Glu Lys Pro Ala Glu Gln Pro Lys Ala Glu Lys Thr			
420	425	430	
Asp Asp Gln Gln Ala Glu Glu			
435			
<210> 31			
<211> 419			
<212> PRT			
<213> Streptococcus pneumoniae			
<400> 31			
Ala Val Ala Ser Leu Val Met Gly Ser Val Val His Ala Thr Glu Asn			
1	5	10	15
Glu Gly Thr Thr Gln Ala Pro Thr Ser Ser Asn Arg Gly Asn Glu Ser			
20		25	30
Gln Ala Glu His Met Lys Ala Ala Lys Gln Val Asp Glu Tyr Ile Glu			
35	40	45	
Lys Met Leu Gln Leu Asp Arg Arg Lys His Thr Gln Asn Val Gly Leu			
50	55	60	
Leu Thr Lys Leu Gly Ala Ile Lys Thr Glu Tyr Leu Arg Gly Leu Ser			
65	70	75	80
Val Ser Lys Glu Lys Ser Thr Ala Glu Leu Pro Ser Glu Ile Lys Glu			
85		90	95
Lys Leu Thr Ala Ala Phe Lys Gln Phe Lys Lys Asp Thr Leu Lys Pro			
100		105	110
Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Ala Glu Ala Lys Lys			
115		120	125
Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr Ile			
130	135	140	
Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Glu Val			
145		150	160
Lys Lys Ala Glu Leu Glu Leu Val Lys Val Lys Ala Asn Glu Pro Arg			
165		170	175
Asp Glu Glu Lys Ile Lys Gln Ala Glu Ala Glu Val Glu Ser Lys Lys			
180		185	190
Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg Glu Lys Ala			
195		200	205

Glu Glu Glu Ala Lys Arg Arg Val Asp Ala Lys Glu Gln Asp Glu Ser
 210 215 220

 Ser Lys Arg Arg Lys Ser Arg Val Lys Arg Gly Asp Val Gly Glu Gln
 225 230 235 240

 Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser Ser
 245 250 255

 Val Gly Glu Glu Thr Leu Pro Ser Pro Ser Leu Lys Pro Gly Lys Lys
 260 265 270

 Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Asp Lys Lys Ala Lys
 275 280 285

 Ala Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys
 290 295 300

 Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala
 305 310 315 320

 Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Pro Arg Asn Glu Glu
 325 330 335

 Lys Val Lys Gln Ala Lys Ala Glu Val Glu Ser Lys Lys Ala Glu Ala
 340 345 350

 Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu
 355 360 365

 Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys Val Lys Glu Lys Pro Ala
 370 375 380

 Glu Gln Pro Lys Pro Ala Pro Ala Pro Gln Pro Glu Lys Pro Ala Pro
 385 390 395 400

 Lys Pro Glu Asn Pro Ala Glu Gln Pro Lys Ala Glu Lys Pro Ala Asp
 405 410 415

 Gln Gln Ala

<210> 32
 <211> 437
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 32
 Val Ala Ser Leu Phe Met Gly Ser Val Val His Ala Thr Glu Lys Glu
 1 5 10 15

 Val Thr Thr Gln Val Ala Thr Ser Ser Asn Lys Ala Asn Lys Ser Gln
 20 25 30

 Thr Glu His Met Lys Ala Ala Lys Gln Val Asp Glu Tyr Ile Lys Lys
 35 40 45

Lys Leu Gln Leu Asp Arg Arg Lys His Thr Gln Asn Val Gly Leu Leu
 50 55 60

Thr Lys Leu Gly Val Ile Lys Thr Glu Tyr Leu His Gly Leu Ser Val
 65 70 75 80

Ser Lys Lys Lys Ser Glu Ala Glu Leu Pro Ser Glu Ile Lys Ala Lys
 85 90 95

Leu Asp Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Leu Pro Thr Glu
 100 105 110

Pro Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Lys
 115 120 125

Lys Lys Ala Glu Asp Gln Lys Glu Lys Asp Leu Arg Asn Tyr Pro Thr
 130 135 140

Asn Thr Tyr Lys Thr Leu Glu Leu Asp Ile Ala Glu Ser Asp Val Glu
 145 150 155 160

Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Ser
 165 170 175

Arg Asp Glu Lys Lys Ile Asn Gln Ala Lys Val Glu Asn Lys
 180 185 190

Lys Ala Glu Ala Thr Arg Leu Lys Asn Ile Lys Thr Asp Arg Glu Lys
 195 200 205

Ala Glu Glu Ala Lys Arg Arg Ala Asp Ala Lys Leu Gln Glu Ala Asn
 210 215 220

Val Ala Thr Ser Glu Gln Asp Lys Ser Lys Arg Arg Ala Lys Arg Glu
 225 230 235 240

Val Phe Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys
 245 250 255

Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Thr Ser Pro Ser Leu
 260 265 270

Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala
 275 280 285

Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro
 290 295 300

Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val
 305 310 315 320

Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu
 325 330 335

Ser Arg Asn Glu Glu Lys Ile Lys Gln Val Lys Ala Lys Val Glu Ser
 340 345 350

Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Lys
355 360 365

Lys Ala Glu Glu Glu Ala Lys Arg Arg Ala Ala Glu Glu Asp Lys
370 375 380

Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Gln
385 390 395 400

Pro Glu Lys Pro Thr Glu Glu Pro Glu Asn Pro Ala Pro Ala Pro Ala
405 410 415

Pro Lys Pro Glu Asn Pro Ala Glu Lys Pro Lys Ala Glu Lys Pro Ala
420 425 430

Asp Gln Gln Ala Glu
435

<210> 33

<211> 433

<212> PRT

<213> Streptococcus pneumoniae

<400> 33

Cys Thr Val Ala Ser Leu Val Met Gly Ser Val Val His Ala Thr Glu
1 5 10 15

Asn Glu Arg Thr Thr Gln Val Pro Thr Ser Ser Asn Arg Gly Lys Pro
20 25 30

Glu Arg Arg Lys Ala Ala Glu Gln Phe Asp Glu Tyr Ile Asn Lys Met
35 40 45

Ile Gln Leu Asp Lys Arg Lys His Thr Gln Asn Leu Ala Phe Asn Ile
50 55 60

Gln Leu Ser Arg Ile Lys Thr Glu Tyr Leu Asn Gly Leu Lys Glu Lys
65 70 75 80

Ser Glu Ala Glu Leu Pro Ser Lys Ile Lys Ala Glu Leu Asp Ala Ala
85 90 95

Phe Lys Gln Phe Lys Lys Asp Thr Leu Pro Thr Glu Pro Glu Lys Lys
100 105 110

Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Glu Lys Lys Val Ala
115 120 125

Glu Ala Lys Lys Lys Ala Lys Ala Gln Lys Glu Glu Asp His Arg Asn
130 135 140

Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Asp Leu Glu Ile Ala Glu Phe
145 150 155 160

Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Lys Glu Ala

165	170	175
Asp Glu Ser Arg Asn Glu Gly Thr Ile Asn Gln Ala Lys Ala Lys Val		
180	185	190
Glu Ser Glu Lys Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp		
195	200	205
Arg Glu Lys Ala Glu Glu Glu Ala Lys Arg Arg Ala Asp Ala Lys		
210	215	220
Glu Gln Asp Glu Ser Lys Arg Arg Lys Ser Arg Gly Lys Arg Gly Ala		
225	230	235
Leu Gly Glu Gln Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser		
245	250	255
Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser Leu Lys		
260	265	270
Pro Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Asp		
275	280	285
Lys Lys Ala Lys Ala Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr		
290	295	300
Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Lys		
305	310	315
Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Ser		
325	330	335
Arg Asn Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys Val Glu Ser Lys		
340	345	350
Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys Lys		
355	360	365
Ala Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys Val Lys		
370	375	380
Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Gln Pro Glu		
385	390	395
Lys Pro Ala Glu Glu Pro Glu Asn Pro Val Pro Ala Pro Lys Pro Glu		
405	410	415
Asn Pro Ala Glu Gln Pro Lys Ala Glu Lys Pro Ala Asp Gln Gln Ala		
420	425	430
Glu		

<210> 34
<211> 427
<212> PRT

<213> Streptococcus pneumoniae

<400> 34

Val	Ala	Val	Ala	Ser	Leu	Val	Met	Gly	Ser	Val	Val	His	Ala	Thr	Glu
1				5					10					15	
Lys	Glu	Val	Thr	Thr	Gln	Val	Pro	Thr	Tyr	Ser	Asn	Met	Ala	Lys	Thr
		20				25							30		
Glu	His	Arg	Lys	Ala	Ala	Lys	Gln	Val	Val	Asp	Glu	Tyr	Ile	Glu	Lys
		35				40							45		
Met	Leu	Arg	Glu	Ile	Gln	Leu	Asp	Arg	Arg	Lys	His	Thr	Gln	Asn	Phe
		50				55						60			
Ala	Phe	Asn	Met	Lys	Leu	Ser	Ala	Ile	Lys	Thr	Glu	Tyr	Leu	Tyr	Gly
		65				70				75			80		
Leu	Lys	Glu	Lys	Ser	Glu	Ala	Glu	Leu	Pro	Ser	Glu	Val	Lys	Ala	Lys
		85					90						95		
Leu	Asp	Ala	Ala	Phe	Glu	Gln	Phe	Lys	Lys	Asp	Thr	Leu	Lys	Leu	Gly
		100					105					110			
Glu	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys
		115				120					125				
Ala	Lys	Ala	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Asn	Thr
		130				135					140				
Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Glu	Val	Lys
		145				150				155			160		
Lys	Ala	Glu	Leu	Glu	Leu	Lys	Glu	Glu	Ala	Lys	Thr	Arg	Asn	Glu	
		165					170				175				
Asp	Thr	Ile	Asn	Gln	Ala	Lys	Ala	Lys	Val	Glu	Ser	Lys	Lys	Ala	Glu
		180				185				190					
Ala	Thr	Lys	Leu	Glu	Glu	Ile	Lys	Thr	Asp	Arg	Lys	Lys	Ala	Glu	Glu
		195				200					205				
Glu	Ala	Lys	Arg	Lys	Ala	Glu	Ala	Glu	Glu	Asp	Lys	Val	Lys	Asp	Lys
		210				215				220					
Leu	Lys	Arg	Arg	Thr	Lys	Arg	Ala	Val	Pro	Gly	Glu	Pro	Ala	Thr	Pro
		225				230				235			240		
Asp	Lys	Lys	Glu	Asn	Asp	Ala	Lys	Ser	Ser	Asp	Ser	Ser	Val	Gly	Glu
		245					250					255			
Glu	Thr	Leu	Pro	Ser	Pro	Ser	Leu	Lys	Ser	Gly	Lys	Lys	Val	Ala	Glu
		260					265				270				
Ala	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Ala	Lys	Asp	Gln	Lys
		275				280					285				

Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Asp
290						295						300			
Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Lys	Val	Lys	Glu	Ala	Glu	Leu	Glu
305						310					315				320
Leu	Val	Lys	Glu	Glu	Ala	Lys	Gly	Ser	Arg	Asn	Glu	Glu	Lys	Ile	Asn
									325		330				335
Gln	Ala	Lys	Ala	Glu	Val	Glu	Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu
								340		345					350
Glu	Lys	Ile	Lys	Thr	Asp	Arg	Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys	Arg
								355		360					365
Lys	Ala	Ala	Glu	Glu	Asp	Lys	Val	Lys	Glu	Lys	Pro	Ala	Glu	Gln	Pro
								370		375					380
Gln	Pro	Ala	Pro	Ala	Pro	Gln	Pro	Glu	Lys	Pro	Thr	Glu	Glu	Pro	Glu
								385		390					400
Asn	Pro	Ala	Pro	Ala	Pro	Lys	Pro	Glu	Lys	Pro	Ala	Glu	Gln	Pro	Lys
									405		410				415
Ala	Glu	Lys	Thr	Asp	Asp	Gln	Gln	Ala	Glu	Glu					
								420		425					

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<210> 35
<211> 413
<212> PRT
<213> Streptococcus pneumoniae

<400> 35
Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr Ser Ser Asn Met Ala Lys
 1           5           10          15

Thr Glu His Arg Lys Ala Ala Lys Gln Val Val Asp Glu Tyr Ile Glu
 20          25          30

Lys Met Leu Arg Glu Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn
 35          40          45

Val Ala Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Arg
 50          55          60

Glu Leu Asn Val Leu Glu Glu Lys Ser Lys Asp Glu Leu Pro Ser Glu
 65          70          75          80

Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr
 85          90          95

Leu Lys Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu
100         105         110

Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr
115         120         125

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Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp
 130 135 140

Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys
 145 150 155 160

Glu Ser Arg Asn Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu
 165 170 175

Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg
 180 185 190

Lys Lys Ala Glu Glu Ala Lys Arg Lys Ala Asp Ala Lys Leu Lys
 195 200 205

Glu Ala Asn Val Ala Thr Ser Asp Gln Gly Lys Pro Lys Gly Arg Ala
 210 215 220

Lys Arg Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn
 225 230 235 240

Asp Ala Lys Ser Ser Asp Ser Val Gly Glu Glu Thr Leu Pro Ser
 245 250 255

Ser Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val
 260 265 270

Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg
 275 280 285

Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile Ala Glu
 290 295 300

Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu
 305 310 315 320

Ala Lys Glu Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys
 325 330 335

Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr
 340 345 350

Asp Arg Lys Lys Ala Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu
 355 360 365

Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala
 370 375 380

Thr Gln Pro Glu Lys Pro Ala Pro Lys Pro Glu Lys Pro Ala Glu Gln
 385 390 395 400

Pro Lys Ala Glu Lys Thr Asp Asp Gln Gln Ala Glu Glu
 405 410

<210> 36

<211> 425
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 36
 Tyr Ile Ala Ser Leu Phe Leu Gly Gly Val Val His Ala Glu Gly Val
 1 5 10 15

Arg Ser Glu Asn Asn Pro Thr Val Thr Ser Ser Gly Gln Asp Ile Ser
 20 25 30

Lys Lys Tyr Ala Asp Glu Val Lys Ser His Leu Glu Lys Ile Leu Ser
 35 40 45

Glu Ile Gln Thr Asn Leu Asp Arg Ser Lys His Ile Lys Thr Val Asn
 50 55 60

Leu Ile Asn Lys Leu Gln Asp Ile Lys Arg Thr Tyr Leu Tyr Glu Leu
 65 70 75 80

Asn Val Leu Glu Asp Lys Ser Lys Ala Glu Leu Pro Ser Lys Ile Lys
 85 90 95

Ala Glu Leu Asp Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Leu Pro
 100 105 110

Thr Glu Pro Gly Lys Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu
 115 120 125

Ala Glu Lys Lys Ala Lys Ala Gln Lys Glu Glu Asp Tyr Arg Asn Tyr
 130 135 140

Pro Thr Ile Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp
 145 150 155 160

Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Lys Glu Ala Asp
 165 170 175

Glu Ser Arg Asn Glu Gly Thr Ile Asn Gln Ala Lys Ala Lys Val Glu
 180 185 190

Ser Glu Gln Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg
 195 200 205

Glu Lys Ala Glu Glu Ala Lys Arg Arg Ala Asp Ala Lys Glu Gln
 210 215 220

Asp Glu Ser Lys Arg Arg Lys Ser Arg Val Lys Arg Gly Asp Phe Gly
 225 230 235 240

Glu Pro Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp
 245 250 255

Ser Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser Leu Lys Pro Gly
 260 265 270

Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Glu Lys Lys

275

280

285

Ala Lys Asp Gln Lys Glu Glu Asp His Arg Asn Tyr Pro Thr Ile Thr
290 295 300

Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys
305 310 315 320

Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Gly Ser Arg Asn
325 330 335

Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu Ser Lys Lys Ala
340 345 350

Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys Lys Ala Glu
355 360 365

Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys Val Lys Glu Lys
370 375 380

Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Gln Pro Glu Lys Pro
385 390 395 400

Ala Pro Ala Pro Lys Pro Glu Asn Pro Ala Glu Gln Pro Lys Ala Glu
405 410 415

Lys Pro Ala Asp Gln Gln Ala Glu Glu
420 425

<210> 37

<211> 439

<212> PRT

<213> Streptococcus pneumoniae

<400> 37

Ala Ser Leu Phe Leu Gly Gly Val Val His Ala Glu Gly Val Arg Ser
1 5 10 15

Gly Asn Asn Ser Thr Val Thr Ser Ser Gly Gln Asp Ile Ser Lys Lys
20 25 30

Tyr Ala Asp Glu Val Glu Ser His Leu Gln Ser Ile Leu Lys Asp Val
35 40 45

Asn Lys Asn Leu Lys Lys Val Gln His Thr Gln Asn Ala Asp Phe Asn
50 55 60

Lys Lys Leu Ser Lys Ile Lys Thr Lys Tyr Leu Tyr Glu Leu Asn Val
65 70 75 80

Leu Glu Glu Lys Ser Glu Ala Glu Leu Thr Ser Lys Thr Lys Glu Thr
85 90 95

Lys Glu Glu Leu Thr Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Leu
100 105 110

Ser Thr Glu Pro Glu Lys Lys Val Ala Glu Ala Lys Lys Lys Val Glu
 115 120 125

 Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Lys Asp Arg Arg Asn
 130 135 140

 Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser
 145 150 155 160

 Asp Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Val Lys Ala
 165 170 175

 Asn Glu Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Glu Ala Lys Val
 180 185 190

 Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp
 195 200 205

 Arg Glu Gln Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg
 210 215 220

 Glu Gln Ala Glu Glu Glu Ala Lys Val Lys Asp Glu Pro Lys Lys Arg
 225 230 235 240

 Thr Lys Arg Gly Val Leu Gly Glu Pro Ala Thr Pro Asp Lys Lys Glu
 245 250 255

 Asn Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro
 260 265 270

 Ser Pro Ser Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys
 275 280 285

 Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg
 290 295 300

 Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala
 305 310 315 320

 Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu
 325 330 335

 Glu Ala Lys Glu Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala
 340 345 350

 Glu Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys
 355 360 365

 Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu
 370 375 380

 Glu Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro
 385 390 395 400

 Ala Pro Gln Pro Glu Lys Pro Ala Pro Lys Pro Glu Lys Pro Ala Pro
 405 410 415

Ala Pro Lys Pro Glu Asn Pro Ala Glu Gln Pro Lys Ala Glu Lys Pro
420 425 430

Ala Asp Gln Gln Ala Glu Glu
435

<210> 38
<211> 460
<212> PRT
<213> Streptococcus pneumoniae

<400> 38
Cys Ile Val Ala Ser Leu Val Met Gly Ser Val Val His Ala Thr Glu
1 5 10 15

Asn Glu Gly Ala Thr Gln Val Pro Thr Ser Ser Asn Arg Ala Asn Glu
20 25 30

Ser Gln Ala Glu Gln Gly Glu Gln Pro Lys Lys Leu Asp Ser Glu Arg
35 40 45

Asp Lys Ala Arg Lys Glu Val Glu Glu Tyr Val Lys Lys Ile Val Gly
50 55 60

Glu Ser Tyr Ala Lys Ser Thr Lys Lys Arg His Thr Ile Thr Val Ala
65 70 75 80

Leu Val Asn Glu Leu Asn Asn Ile Lys Asn Glu Tyr Leu Asn Lys Ile
85 90 95

Val Glu Ser Thr Ser Glu Ser Gln Leu Gln Ile Leu Met Met Glu Ser
100 105 110

Arg Ser Lys Val Asp Glu Ala Val Ser Lys Phe Glu Lys Asp Ser Ser
115 120 125

Ser Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser Asp Thr
130 135 140

Ala Lys Pro Asn Lys Pro Thr Glu Pro Gly Glu Lys Val Ala Glu Ala
145 150 155 160

Lys Lys Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu
165 170 175

Glu Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu Leu
180 185 190

Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu Leu
195 200 205

Val Lys Val Lys Ala Asn Glu Pro Arg Asp Glu Gln Lys Ile Lys Gln
210 215 220

Ala Glu Ala Glu Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu Lys
225 230 235 240

Lys Ile Lys Thr Asp Arg Glu Glu Ala Glu Glu Ala Lys Arg Arg
 245 250 255

 Ala Asp Ala Lys Glu Gln Gly Lys Pro Lys Gly Arg Ala Lys Arg Gly
 260 265 270

 Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys
 275 280 285

 Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser Leu
 290 295 300

 Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala
 305 310 320

 Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro
 325 330 335

 Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val
 340 345 350

 Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu
 355 360 365

 Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu Ser
 370 375 380

 Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys
 385 390 400

 Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys Val
 405 410 415

 Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Lys Ala
 420 425 430

 Glu Lys Pro Ala Pro Ala Pro Lys Pro Glu Asn Pro Ala Glu Gln Pro
 435 440 445

 Lys Ala Glu Lys Pro Ala Asp Gln Gln Ala Glu Glu
 450 455 460

<210> 39
 <211> 459
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 39
 Ile Val Ala Ser Leu Val Met Gly Ser Val Val His Ala Thr Glu Asn
 1 5 10 15

Glu Gly Ala Thr Gln Val Pro Thr Ser Ser Asn Arg Ala Asn Glu Ser
 20 25 30

Gln Ala Glu Gln Gly Glu Gln Pro Lys Lys Leu Asp Ser Glu Arg Asp

35	40	45
Lys Ala Arg Lys Glu Val Glu Glu Tyr Val Lys Lys Ile Val Gly Glu		
50	55	60
Ser Tyr Ala Lys Ser Thr Lys Lys Arg His Thr Ile Thr Val Ala Leu		
65	70	75
Val Asn Glu Leu Asn Asn Ile Lys Asn Glu Tyr Leu Asn Lys Ile Val		
85	90	95
Glu Ser Thr Ser Glu Ser Gln Leu Gln Ile Leu Met Met Glu Ser Arg		
100	105	110
Ser Lys Val Asp Glu Ala Val Ser Lys Phe Glu Lys Asp Ser Ser Ser		
115	120	125
Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser Asp Thr Ala		
130	135	140
Lys Pro Asn Lys Pro Thr Glu Pro Gly Glu Lys Val Ala Glu Ala Lys		
145	150	155
160		
Lys Lys Val Glu Glu Val Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu		
165	170	175
Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu Leu Glu		
180	185	190
Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val		
195	200	205
Lys Val Lys Ala Asn Glu Pro Arg Asp Lys Gln Lys Ile Lys Gln Ala		
210	215	220
Glu Ala Glu Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu Lys Lys		
225	230	235
240		
Ile Lys Thr Asp Arg Glu Glu Ala Glu Glu Ala Lys Arg Arg Ala		
245	250	255
Asp Ala Lys Glu Gln Gly Lys Pro Lys Gly Arg Pro Lys Arg Gly Val		
260	265	270
Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser		
275	280	285
Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser Leu Lys		
290	295	300
Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Lys		
305	310	315
320		
Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr		
325	330	335
Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Glu		

340	345	350
Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Pro		
355	360	365
Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu Ser Lys		
370	375	380
Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys Lys		
385	390	395
Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys Val Lys		
405	410	415
Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Lys Thr Glu		
420	425	430
Lys Pro Ala Pro Ala Pro Lys Pro Glu Asn Pro Ala Glu Gln Pro Lys		
435	440	445
Ala Glu Lys Pro Ala Asp Gln Gln Ala Glu Glu		
450	455	
<210> 40		
<211> 437		
<212> PRT		
<213> Artificial Sequence		
<220>		
<223> consensus sequence		
<400> 40		
Ala Val Ala Ser Leu Val Met Gly Ser Val Val His Ala Thr Glu Asn		
1	5	10
		15
Glu Val Thr Thr Gln Val Ala Thr Ser Ser Asn Arg Ala Asn Glu Ser		
20	25	30
Gln Thr Glu His Arg Lys Ala Ala Lys Gln Val Asp Glu Tyr Ile Lys		
35	40	45
Lys Met Leu Gln Leu Asp Arg Arg Lys His Thr Gln Asn Val Ala Leu		
50	55	60
Asn Thr Lys Leu Ser Ala Ile Lys Thr Glu Tyr Leu Asn Gly Leu Ser		
65	70	75
		80
Val Leu Glu Glu Lys Ser Glu Ala Glu Leu Pro Ser Glu Ile Lys Ala		
85	90	95
Lys Leu Asp Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Leu Pro Thr		
100	105	110
Glu Pro Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala		
115	120	125

Lys	Lys	Lys	Ala	Glu	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro
130						135					140				
Thr	Ile	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val
145					150					155				160	
Glu	Val	Lys	Lys	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Lys	Glu
		165						170			175				
Ser	Arg	Asp	Glu	Gly	Lys	Ile	Asn	Gln	Ala	Lys	Ala	Lys	Val	Glu	Ser
	180						185				190				
Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Lys	Lys	Ile	Lys	Thr	Asp	Arg	Glu
		195				200					205				
Lys	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Arg	Ala	Asp	Ala	Lys	Leu	Gln	Glu
	210					215				220					
Ala	Asn	Val	Ala	Ser	Glu	Gln	Asp	Lys	Pro	Lys	Gly	Arg	Ala	Lys	Arg
	225				230				235			240			
Gly	Val	Pro	Gly	Glu	Leu	Ala	Thr	Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala
	245					250				255					
Lys	Ser	Ser	Asp	Ser	Ser	Val	Gly	Glu	Glu	Thr	Leu	Pro	Ser	Pro	Ser
	260						265				270				
Leu	Lys	Pro	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu
	275					280				285					
Ala	Lys	Lys	Lys	Ala	Glu	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr
	290					295				300					
Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp
	305					310				315			320		
Val	Glu	Val	Lys	Lys	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Lys
	325						330				335				
Glu	Ser	Arg	Asn	Glu	Glu	Lys	Val	Lys	Gln	Ala	Lys	Ala	Glu	Val	Glu
	340						345				350				
Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Lys	Ile	Lys	Thr	Asp	Arg
	355					360				365					
Lys	Lys	Ala	Glu	Glu	Ala	Lys	Arg	Lys	Ala	Ala	Glu	Glu	Asp	Lys	
	370					375				380					
Val	Lys	Glu	Lys	Pro	Ala	Glu	Gln	Pro	Gln	Pro	Ala	Pro	Ala	Pro	Gln
	385					390				395			400		
Pro	Glu	Lys	Pro	Ala	Glu	Glu	Pro	Glu	Asn	Pro	Ala	Pro	Ala	Pro	Pro
	405						410				415				
Lys	Pro	Glu	Asn	Pro	Ala	Glu	Gln	Pro	Lys	Ala	Glu	Lys	Pro	Ala	Asp
	420						425				430				

Gln Gln Ala Glu Glu
435